BEST AVAILABLE COPY

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-284254

(43)Date of publication of application : 23.10.1998

(51)Int.Cl. H05B 33/22
H05B 33/06

(21)Application number : 09-086597

(22)Date of filing : 04.04.1997

(71)Applicant : FUTABA CORP

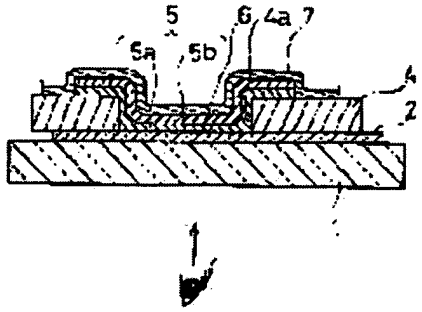
(72)Inventor : FUKUDA TATSUO
TSURUOKA YOSHIHISA
TANAKA SATORU
MIYAUCHI TOSHIO

(54) ORGANIC ELECTROLUMINESCENCE ELEMENT

(57)Abstract:

PROBLEM TO BE SOLVED: To conduct a display having extremely little uneven luminance requiring no formation of a high precision luminescence pattern shape of an electrode.

SOLUTION: On a glass substrate 1, a transparent electrode 2 is formed on each one unit of a luminescence pattern so as to have a larger area than that of one luminescence pattern. An insulation layer 4 on the transparent electrode 2 has a through portion 4a hollowed into the shape of the luminescence pattern, and is laminating formed as leaving the end portion of the electrode 2 so as to cover the other portion. On the insulation layer, an organic layer 5 made of two layers of an electron hole transport layer 5a and a luminescence layer 5b is laminating formed in an entering state in the through portion 4a of the insulation layer. On the luminescence layer 5b, a metal electrode 7 is laminating formed so as to cover two luminescence patterns. A DC power supply is connected between the transparent electrode 2 and the metal electrode 7. When a voltage is applied using the transparent electrode 2 as a positive electrode so as to cause a current to flow between the transparent electrode 2 and the metal electrode 7, a luminescence portion 6 in the insulation layer 4



through portion 4a emits light, and the light emission at this point is observed from a glass substrate 1 side.

LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] the organic electroluminescent element which laminating formation of the organic layer is carried out inter-electrode [which one / at least / electrode becomes from a translucency member / two], impresses an electrical potential difference by making one electrode into an anode plate, passes a current to inter-electrode [said / two], and performs a predetermined pattern display -- setting -- the configuration of a luminescence pattern -- ****** -- him -- the organic electroluminescent element characterized by preparing the insulating layer which has ******** in inter-electrode [said / two].
[Claim 2] It is the organic electroluminescent element according to claim 1 by which said two electrodes consisted of transparent electrodes and metal electrodes, said transparent electrode was formed on the glass substrate, and laminating formation of said insulating layer was carried out on this transparent electrode or said organic layer.
[Claim 3] It is the organic electroluminescent element according to claim 1 by which said two electrodes consisted of transparent electrodes and metal electrodes, said metal electrode was formed on the insulating substrate, and laminating formation of said insulating layer was carried out on this metal electrode or said organic layer.
[Claim 4] Said organic layer is an organic electroluminescent element given in any of claims 1-3 they are it is unstated from combination with the charge transportation layer containing the luminous layer of one layer, or a luminous layer.
[Claim 5] Said insulating layer is an organic electroluminescent element given in any of claims 1-4 formed more thickly than the thickness of said organic layer of said penetration circles which form a light-emitting part they are.
[Claim 6] Said insulating layer is an organic electroluminescent element given in any of claims 1-5 by which the permeability with the wavelength of 400nm or more of light was formed to 20% or less they are.
[Claim 7] Said insulating layer is an organic electroluminescent element given in any of claims 1-5 by which the reflection factor with the wavelength of 400nm or more of light was formed to 20% or less they are.

[Translation done.]

* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the organic electroluminescent element (it is hereafter called an organic EL device for short) equipped with two or more fixed display segments which consist of a laminated structure of an anode plate, an organic layer, and cathode.
[0002]
[Description of the Prior Art] The configuration of a common organic EL device is shown in drawing 6 . The transparent electrode 22 with which the organic EL device shown in drawing 6 consists of ITO (Indium Tin Oxide) on the glass substrate 21 is formed, the laminating of the organic layer 23 (two-layer [of electron hole transportation layer 23a and luminous layer 23b]) by the organic fluorescent substance thin film is carried out on a transparent electrode 22, the laminating of the metal electrodes 24, such as aluminum, Ag, Mg:Ag, and aluminum:Li, is further carried out on luminous layer 23b, and DC power supply 25 are connected between a transparent electrode 22 and a metal electrode 24. Into the periphery part of the glass substrate 21, where two electrodes 22 and 24 are pulled out outside, the tooth-back plate 26 fixes with adhesives so that a laminating part may be covered.
[0003] In the organic EL device by the above-mentioned configuration, by making a transparent electrode 22 into an anode plate, an electrical potential difference is impressed and a current is passed between a transparent electrode 22 and a metal electrode 24 from DC power supply 25. Thereby, an electron and an electron hole are poured in from each electrodes 22 and 24 to an organic layer 23. And the electron and electron hole which were poured in recombine, an exciton (EKISHINTON) is generated, and it displays using emission (fluorescence and phosphorescence) of the light at the time of this exciton deactivating. Luminescence at this time is observed from the glass substrate 21 side.
[0004] By the way, in the conventional organic EL device by the above-mentioned configuration, one electrode of a transparent electrode 22 or a metal electrode 24 is formed in solid one, the electrode of another side is formed in the configuration of a luminescence pattern, and the luminescence display by the fixed pattern is performed.
[0005]
[Problem(s) to be Solved by the Invention] However, in the organic EL device by the above-mentioned configuration, when a luminescence pattern is formed with a transparent electrode 22, since resistance is high compared with a common metal, a transparent electrode 22 will produce brightness nonuniformity according to the resistance difference to a light-emitting part, if a thin linear luminescence pattern is built. Moreover, when the predetermined luminescence pattern by the transparent electrode 22 is obtained by etching, the amount of [of the pattern] corner tends to sharpen. For this reason, when cathode (metal electrode 24) was immediately in the side for a luminescence pattern corner, a lifting and inter-electrode short-circuited electric-field concentration to a part for that corner, and there was a problem that a lifting and the luminescence pattern to like were destroyed, about poor insulation.
[0006] On the other hand, it was difficult to produce the configuration of a luminescence pattern in the case where a luminescence pattern is formed with a metal electrode 24, using a wet method, since the

organic layer 23 is weak to moisture or an organic solvent. Especially when the configuration of a luminescence pattern was made by laser, productivity was bad and processing costs also had the problem of becoming high.

[0007] Furthermore, even when a luminescence pattern is formed with which electrode of a transparent electrode 22 and a metal electrode 24, if a transparent electrode 22 and the alignment precision between metal-electrode 24 are bad, in order that light may not be emitted except a luminescence pattern (for example, wiring part linked to a luminescence pattern) or the electrode of a part [a part] to make it emitting light may not oppose a confrontation electrode, the character chip phenomenon in which some luminescence patterns do not emit light will be caused.

[0008] Moreover, in the organic EL device of a configuration of being shown in drawing 6 , since the adhesives used for adhesion of the tooth-back plate 26 to the glass substrate 21 had viscosity, when comparing and pasting up the tooth-back plate 26 on the glass substrate 21, adhesives flowed in and invaded into luminous layer 23b, and there was a possibility of polluting luminous layer 23b.

[0009] Then, this invention is made in view of the above-mentioned trouble, does not need to form an electrode in the configuration of a luminescence pattern with a sufficient precision like before, and aims at offering the organic EL device which can perform very little display of brightness nonuniformity.

[0010]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, invention of claim 1 Laminating formation of the organic layer is carried out inter-electrode [which one / at least / electrode becomes from a translucency member / two]. the organic electroluminescent element which impresses an electrical potential difference by making one electrode into an anode plate, passes a current to inter-electrode [said / two], and performs a predetermined pattern display -- setting -- the configuration of a luminescence pattern -- ****** -- him -- it is characterized by preparing the insulating layer which has ******** in inter-electrode [said / two].

[0011] As for invention of claim 2, said two electrodes consist of transparent electrodes and metal electrodes in the organic EL device of claim 1, said transparent electrode is formed on a glass substrate, and it is characterized by carrying out laminating formation of said insulating layer on this transparent electrode or said organic layer.

[0012] As for invention of claim 3, said two electrodes consist of transparent electrodes and metal electrodes in the organic EL device of claim 1, said metal electrode is formed on an insulating substrate, and it is characterized by carrying out laminating formation of said insulating layer on this metal electrode or said organic layer.

[0013] Invention of claim 4 is characterized by said organic layer consisting of combination with the charge transportation layer containing the luminous layer of one layer, or a luminous layer in which organic EL device of claims 1-3.

[0014] Invention of claim 5 is characterized by forming said insulating layer more thickly than the thickness of said organic layer of said penetration circles which form a light-emitting part in which organic EL device of claims 1-4.

[0015] The permeability of light in which said insulating layer has the wavelength of 400nm or more in which organic EL device of claims 1-5 in invention of claim 6 is characterized by being formed to 20% or less.

[0016] The reflection factor of light in which said insulating layer has the wavelength of 400nm or more in which organic EL device of claims 1-5 in invention of claim 7 is characterized by being formed to 20% or less.

[0017]

[Embodiment of the Invention] The top view and drawing 2 which show the gestalt of the 1st operation of the organic EL device according [drawing 1] to this invention are the partial expansion sectional side elevation of drawing 1 .

[0018] The organic EL device by the gestalt of the 1st operation makes the base the glass substrate 1 with the translucency which consists of an insulating member formed in the shape of a rectangle.

[0019] the transparent electrode 2 which becomes the front face of the glass substrate 1 from ITO etc. --

the etching method, mask vacuum deposition, etc. -- abbreviation -- it is formed in the shape of a rectangle by uniform thickness. This transparent electrode 2 is equivalent to one luminescence pattern 3 (E [of drawing 1], pattern of L), or is formed for every unit of the luminescence pattern 3 in a larger area than one luminescence pattern 3.

[0020] As shown in drawing 1 and drawing 2 , on the transparent electrode 2, laminating formation of the insulating layer 4 of high resistance which consists of baking of an epoxy resin, and frit glass and an organic silica compound etc. is carried out at the shape of a rectangle. an insulating layer 4 -- the configuration of the luminescence pattern 3 -- ****** -- he ******** 4a is had and patternized -- having -- **** -- the end section (the example of drawing 1 lower limit section) of a transparent electrode 2 -- leaving -- other parts -- a wrap -- laminating formation is carried out like.

[0021] an insulating layer 4 -- print processes, mask vacuum deposition, the etching method, etc. -- abbreviation -- it is formed by uniform thickness. Specifically, it is SiN and SiO2. It extracts in a desired pattern configuration by the etching method, and also frit glass and an organic silica compound can be printed in a desired pattern configuration, and can be calcinated, or an insulating layer 4 can be formed by carrying out patterning of the heat-resistant sensitization resin to a predetermined pattern configuration by the technique of a photolithography.

[0022] As shown in drawing 1 and drawing 2 , in the field containing the luminescence pattern 3 on an insulating layer 4, laminating formation of the organic layer 5 is carried out. this organic layer 5 -- penetration section 4a -- entering -- making -- every unit of the luminescence pattern 3 -- abbreviation -- laminating formation is carried out by uniform thickness at the shape of a rectangle. In the gestalt of this operation, an organic layer 5 consists of two-layer [of electron hole transportation layer 5a which consists of organic compounds, such as Diamine and luminous layer 5b which consists of an organic compound], and a laminating is carried out to the order of electron hole transportation layer 5a and luminous layer 5b.

[0023] The part of the organic layer 5 which entered into penetration section 4a of an insulating layer 4 forms the light-emitting part 6. And when this light-emitting part 6 emits light, the display by the configuration of the luminescence pattern 3 can be observed from the glass substrate 1 side.

[0024] In addition, as a luminescent material of luminous layer 5b, when making the luminous layer 5b itself emit light, for example, an aluminum quinoline (Alq), a JISUCHIRU arylene system compound, etc. are used. Moreover, when making a dopant emit light to luminous layer 5b by carrying out minute amount doping of another luminescent material (dopant), Quinacridone (Qd), the coloring matter for laser, etc. are used as a dopant.

[0025] As shown in drawing 1 and drawing 2 , as two luminescence patterns 3 are covered, on luminous layer 5b which constitutes an organic layer 5, laminating formation of the metal electrode 7 is carried out. a metal electrode 7 -- from aluminum, Ag, Mg:Ag, aluminum:Li, etc. -- becoming -- the etching method, mask vacuum deposition, etc. -- abbreviation -- it is formed in the shape of a rectangle by uniform thickness. Between this metal electrode 7 and transparent electrode 2, a power source (DC power supply) 9 is connected so that a transparent electrode 2 may turn into an anode plate and a metal electrode 7 may turn into cathode.

[0026] In the organic EL device by the above-mentioned configuration, by making a transparent electrode 2 into an anode plate, if an electrical potential difference is impressed between a transparent electrode 2 and a metal electrode 7 and a current is passed, the light-emitting part 6 of the luminescence pattern 3 will emit light. Luminescence of the luminescence pattern 3 by the light-emitting part 6 at this time is observed from the glass substrate 1 side. Moreover, the pulse drive of the transparent electrode 2 can be carried out, and the light-emitting part 6 of which luminescence pattern 3 (the example of drawing 1 E or L) can be made to emit light by selection of one transparent electrode 2 and metal electrode 7 in the above-mentioned configuration. Moreover, two or more luminescence patterns are made to emit light by time sharing, and an alphabetic character and a graphic form can be displayed combining two or more luminescence patterns using the after-image property of an eye.

[0027] Next, the top view and drawing 4 which show the gestalt of the 2nd operation of the organic EL device according [drawing 3] to this invention are the partial expansion sectional side elevation of

drawing 3 .
[0028] The organic EL device by the gestalt of the 2nd operation makes the base the insulating substrate 8 formed in the shape of a rectangle. This insulating substrate 8 does not necessarily need to have translucency like the gestalt of the 1st operation. In addition, the same number is given to the same component as the gestalt of the 1st operation, and it explains. Moreover, about the formation approach of each electrode and each class, it is carried out like the gestalt of the 1st operation.
[0029] As shown in drawing 3 and drawing 4 , the metal electrode 7 is formed in the front face of an insulating substrate 8. or this metal electrode 7 is equivalent to one luminescence pattern 3 (E [of drawing 3], pattern of L) -- a larger area than one luminescence pattern 3 -- every unit of the luminescence pattern 3 -- abbreviation -- it is formed in the shape of a rectangle by uniform thickness.
[0030] On the metal electrode 7, laminating formation of the insulating layer 4 of high resistance is carried out at the shape of a rectangle. an insulating layer 4 -- the gestalt of the 1st operation -- the same -- the configuration of the luminescence pattern 3 -- ****** -- he ******** 4a -- having -- **** -- the end section (the example of drawing 3 lower limit section) of a metal electrode 7 -- leaving -- other parts -- a wrap -- like -- abbreviation -- laminating formation is carried out by uniform thickness at the shape of a rectangle.
[0031] As shown in drawing 3 and drawing 4 , in the field containing the luminescence pattern 3 on an insulating layer 4, laminating formation of the organic layer 5 is carried out. this organic layer 5 -- penetration section 4a -- entering -- making -- every unit of the luminescence pattern 3 -- abbreviation -- laminating formation is carried out by uniform thickness. In the gestalt of this operation, an organic layer 5 consists of two-layer [of electron hole transportation layer 5a which consists of organic compounds, such as Diamine and luminous layer 5b which consists of an organic compound], and a laminating is carried out to the order of luminous layer 5b and electron hole transportation layer 5a.
[0032] The part of the organic layer 5 which entered into penetration section 4a of an insulating layer 4 forms the light-emitting part 6. And when this light-emitting part 6 emits light, the display by the configuration of the luminescence pattern 3 can be observed from a transparent electrode 2 side.
[0033] the transparent electrode 2 which consists of ITO etc. on electron hole transportation layer 5a which constitutes an organic layer 5 as shown in drawing 3 and drawing 4 -- abbreviation -- laminating formation is carried out by uniform thickness. Between this transparent electrode 2 and metal electrode 7, a power source (DC power supply) 9 is connected so that a transparent electrode 2 may turn into an anode plate and a metal electrode 7 may turn into cathode.
[0034] In the organic EL device by the above-mentioned configuration, by making a transparent electrode 2 into an anode plate, if an electrical potential difference is impressed between a transparent electrode 2 and a metal electrode 7 and a current is passed, the light-emitting part 6 of the luminescence pattern 3 will emit light. Luminescence of the luminescence pattern 3 by the light-emitting part 6 at this time is observed from a transparent electrode 2 side. Moreover, the pulse drive of the metal electrode 7 can be carried out, and the light-emitting part 6 of which luminescence pattern 3 (the example of drawing 3 E or L) can be made to emit light in the above-mentioned configuration by selection of one metal electrode 7, a transparent electrode 2, and one metal electrode 7.
[0035] In addition, although especially illustration is not carried out, into the periphery part of the glass substrate 1 of the gestalt of the 1st operation, and the periphery part of the insulating substrate 8 of the gestalt of the 2nd operation, the substrate as a sealing member fixes with adhesives in the ambient atmosphere by inert gas (for example, dry nitrogen) and the dried air which removed water as much as possible. Thereby, a high definition fixed pattern display organic electroluminescence device can be manufactured.
[0036] Therefore, according to the gestalt of operation mentioned above, the effectiveness taken below is done so.
(1) It is not necessary to form a transparent electrode 2 or a metal electrode 7 with a sufficient precision according to the configuration of the luminescence pattern 3.
[0037] (2) Since the wiring width of face of an electrode can fully be taken even when forming a linear luminescence pattern, the need of forming the high transparent electrode 2 of resistance in a line is lost,

and the brightness nonuniformity by the difference of wiring resistance stops occurring.
[0038] (3) In order not to use the edge of electrodes 2 and 7 as a luminescence pattern, possibility of causing dielectric breakdown compared with the former is low.
[0039] (4) Since alignment precision of a transparent electrode 2 and a metal electrode 7 may be made loose, the costs which manufacture takes can be reduced.
[0040] (5) By making thickness of an insulating layer 4 thicker than an organic layer 5, an insulating layer 4 can be produced easily. And since a light-emitting part 6 is formed in penetration section 4a in a location lower than the front face of an insulating layer 4 and improvement in the endurance of a component is aimed at, even when the substrate as a sealing member is sealed, adhesives are dammed up by the insulating layer 4 and can prevent invasion of the adhesives to luminous layer 5b. And the substrate as a sealing member does not contact a light-emitting part 6 directly, and a substrate does not do damage to a light-emitting part 6 by vibration.
[0041] (6) For example, by constituting an insulating layer 4 from dark color (for example, brown, black, etc.) matter, and reducing translucency, reflection of a metal electrode 7 is lost through an insulating layer 4, and the contrast in a bright location improves so that the permeability with the wavelength of 400nm or more of light may become 20% or less.
[0042] (7) For example, by forming an insulating layer 4 and making a reflection factor low, the reflection from an insulating layer 4 decreases and the contrast in a bright location improves so that the reflection factor with the wavelength of 400nm or more of light may become 20% or less.
[0043] By the way, although the gestalt of each operation mentioned above explained as what an organic layer 5 becomes from the two-layer structure of electron hole transportation layer 5a and luminous layer 5b, this organic layer 5 may consist of combination of a luminous layer and charge transportation layers (an electron hole transportation layer, a hole injection and a transportation layer, an electronic injection layer, electron injection, a transportation layer, etc.). Specifically, only one layer only of luminous layers consists of three etc. layers of two-layer [of a luminous layer and an electron hole transportation layer], two-layer [of a luminous layer and an electronic injection layer], an electron hole transportation layer, a luminous layer, and an electronic injection layer etc. In addition, as an electronic injection layer, in order to make an electron easy to pour in, the small alloy of work functions, such as a small metallic material simple substance of work functions, such as Li, Na, Mg, and calcium, or aluminum:Li, Mg:In, and Mg:Ag, is used.
[0044] Moreover, although it considered as the configuration which carries out laminating formation of the insulating layer 4 which has penetration section 4a suitable for the configuration of the luminescence pattern 3 on a transparent electrode 2 and this insulating layer 4 was considered as the configuration which carries out laminating formation on a metal electrode 2 in the gestalt of the 2nd operation with the gestalt of the 1st operation It is good also as a configuration which carries out laminating formation of the insulating layer 4 on which layer (for example, any of an electron hole transportation layer, a luminous layer, and an electronic injection layer are they?) which constitutes an organic layer.
[0045] Furthermore, what is necessary is to obtain the insulation between a transparent electrode 2 and a metal electrode 7, and just to form the insulating layer 4 in the gestalt of each operation by the thickness which is extent to which any parts other than luminescence pattern 3 do not emit light. Moreover, if an insulating layer 4 is made to some extent thick, where an electrode (the metal electrode 7 of the gestalt of the 1st operation or transparent electrode 2 of the gestalt of the 2nd operation) is pulled out outside, the substrate of the same appearance as an insulating layer 4 can be fixed into the periphery part of an insulating layer 4, an envelope can be constituted, and it can act as reinforcing materials (stanchion) when producing a large-sized component.
[0046] By the way, as shown in drawing 5 , it is good also as a configuration which fixes the substrate (for example, glass substrate) 12 as a sealing member which has the translucency which the filter 11 of a request color fixed on a transparent electrode 2 so that a filter 11 may be located in the crevice 10 of transparent electrode 2 front face. According to this configuration, unlike the configuration which arranges on an electrode the filter which can tend to do irregularity, a filter 11 can be arranged regardless of the thickness of electrodes 2 and 7 or an insulating substrate 8. In addition, drawing 5 is the

modification of the gestalt of the 2nd operation, gives the same number to the same component as the gestalt of the 2nd operation, and omits the explanation.
[0047] Moreover, in the gestalt of each operation, a transparent electrode 2 and a metal electrode 7 constitute XY matrix, and if time sharing of the intersection of two electrodes 2 and 7 is carried out and it is made to emit light, the organic EL device which displays an image can consist of sets of a dot.
[0048]
[Effect of the Invention] By the above explanation, according to this invention, very few components of brightness nonuniformity can be produced and effectiveness as taken below is done so so that clearly.
(1) It is not necessary to form an electrode with a sufficient precision according to the configuration of a luminescence pattern, and it can be formed rough.
(2) Since the wiring width of face of an electrode can fully be taken even when forming a linear luminescence pattern, there is no need of forming the high transparent electrode of resistance in a line, and the brightness nonuniformity by the difference of wiring resistance does not occur.
(3) In order not to use the edge of an electrode as a luminescence pattern, it is rare to cause dielectric breakdown.
(4) Alignment precision of electrodes can be made loose and manufacture costs can be reduced.
(5) By making thickness of an insulating layer thicker than an organic layer, an insulating layer can be produced easily. And since a light-emitting part is formed in a location lower than the front face of an insulating layer and improvement in endurance is aimed at, even when the substrate as a sealing member is sealed, adhesives are dammed up by the insulating layer and invasion to a luminous layer can be prevented. And the substrate as a sealing member does not contact a light-emitting part directly, and can prevent damage on the light-emitting part by vibration.
(6) By forming an insulating layer so that the permeability with the wavelength of 400 or more nm of light may become 20% or less, reflection of a metal electrode is lost through an insulating layer, and the contrast in a bright location improves.
(7) By forming an insulating layer so that the reflection factor with the wavelength of 400 or more nm of light may become 20% or less, the reflection from an insulating layer decreases and the contrast in a bright location improves.

[Translation done.]

BEST AVAILABLE COPY

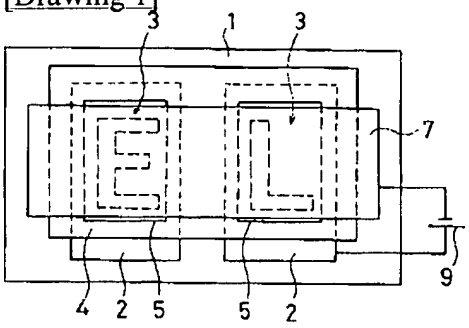
* NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

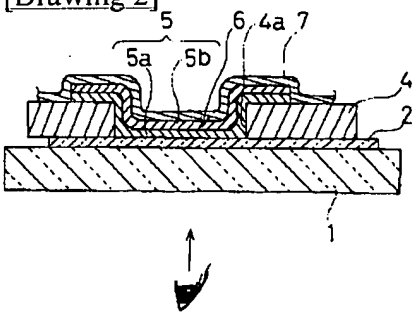
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

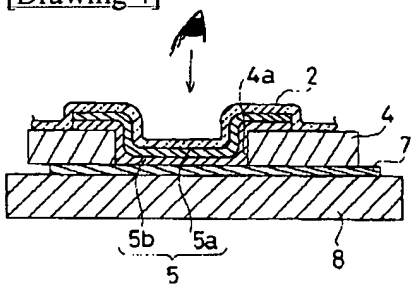
[Drawing 1]



[Drawing 2]

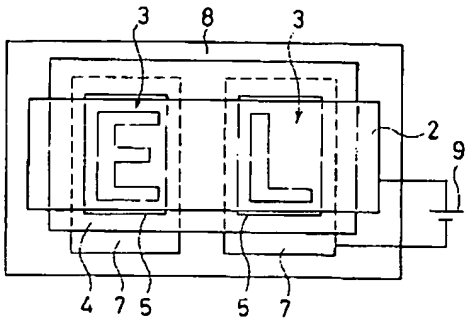


[Drawing 4]

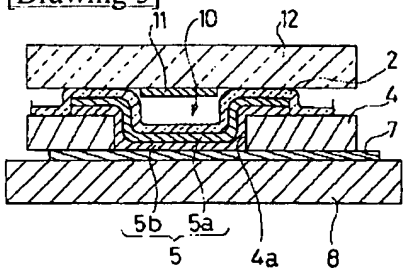


[Drawing 3]

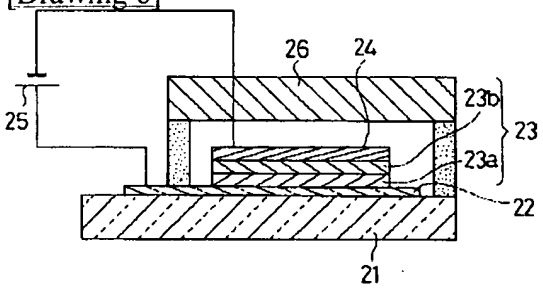
BEST AVAILABLE COPY



[Drawing 5]



[Drawing 6]



[Translation done.]

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-284254
(43)Date of publication of application : 23.10.1998

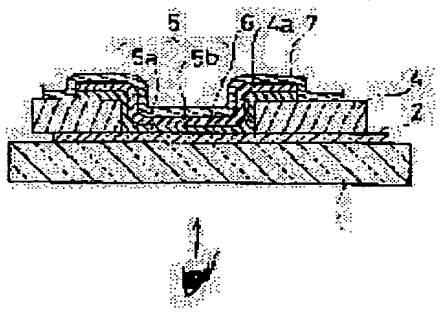
(51)Int.Cl. H05B 33/22
H05B 33/06

(21)Application number : 09-086597
(22)Date of filing : 04.04.1997

(71)Applicant : FUTABA CORP
(72)Inventor : FUKUDA TATSUO
TSURUOKA YOSHIHISA
TANAKA SATORU
MIYAUCHI TOSHIO

(54) ORGANIC ELECTROLUMINESCENCE ELEMENT

(57)Abstract:
PROBLEM TO BE SOLVED: To conduct a display having extremely little uneven luminance requiring no formation of a high precision luminescence pattern shape of an electrode.
SOLUTION: On a glass substrate 1, a transparent electrode 2 is formed on each one unit of a luminescence pattern so as to have a larger area than that of one luminescence pattern. An insulation layer 4 on the transparent electrode 2 has a through portion 4a hollowed into the shape of the luminescence pattern, and is laminating formed as leaving the end portion of the electrode 2 so as to cover the other portion. On the insulation layer, an organic layer 5 made of two layers of an electron hole transport layer 5a and a luminescence layer 5b is laminating formed in an entering state in the through portion 4a of the insulation layer. On the luminescence layer 5b, a metal electrode 7 is laminating formed so as to cover two luminescence patterns. A DC power supply is connected between the transparent electrode 2 and the metal electrode 7. When a voltage is applied using the transparent electrode 2 as a positive electrode so as to cause a current to flow between the transparent electrode 2 and the metal electrode 7, a luminescence portion 6 in the insulation layer 4 through portion 4a emits light, and the light emission at this point is observed from a glass substrate 1 side.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

BEST AVAILABLE COPY

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（A）　(11)特許出願公開番号

特開平10－284254

(43)公開日　平成10年(1998)10月23日

(51)Int.Cl.[6]	識別記号	ＦＩ
Ｈ０５Ｂ　33/22		Ｈ０５Ｂ　33/22
33/06		33/06

審査請求　未請求　請求項の数７　ＯＬ　（全 6 頁）

(21)出願番号　特願平9－86597

(22)出願日　平成９年(1997)４月４日

(71)出願人　000201814
双葉電子工業株式会社
千葉県茂原市大芝629

(72)発明者　福田　辰男
千葉県茂原市大芝629　双葉電子工業株式会社内

(72)発明者　鶴岡　誠久
千葉県茂原市大芝629　双葉電子工業株式会社内

(72)発明者　田中　哲
千葉県茂原市大芝629　双葉電子工業株式会社内

(74)代理人　弁理士　西村　教光

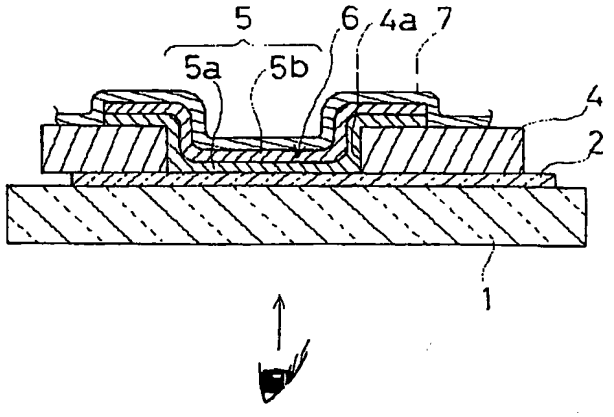
最終頁に続く

(54)【発明の名称】　有機エレクトロルミネッセンス素子

(57)【要約】

【課題】　電極を精度良く発光パターンの形状に形成する必要がなく、輝度ムラの極めて少ない表示を行う。

【解決手段】　硝子基板１上には、透明電極２が１つの発光パターン３より大きい面積で発光パターン３の１単位毎に形成される。透明電極２上の絶縁層４は、発光パターン３の形状にくり抜かれた貫通部４ａを有し、透明電極２の端部を残してその他の部分を覆うように積層形成される。絶縁層４上には、正孔輸送層５ａと発光層５ｂの２層からなる有機層５が絶縁層の貫通部４ａに入り込んだ状態で積層形成される。発光層５ｂ上には、金属電極７が２つの発光パターン３を覆うように積層形成される。透明電極２と金属電極７との間には直流電源９が接続される。透明電極２を陽極として電圧を印加し、透明電極２と金属電極７との間に電流を流すと、絶縁層４の貫通部４ａ内の発光部６が発光し、このときの発光は硝子基板１側から観察される。



【特許請求の範囲】
【請求項１】　少なくとも一方の電極が透光性部材からなる２つの電極間に有機層が積層形成され、一方の電極を陽極として電圧を印加し、前記２つの電極間に電流を流して所定のパターン表示を行う有機エレクトロルミネッセンス素子において、
発光パターンの形状にくり抜かれた貫通部を有する絶縁層が前記２つの電極間に設けられたことを特徴とする有機エレクトロルミネッセンス素子。
【請求項２】　前記２つの電極が透明電極と金属電極からなり、前記透明電極は硝子基板上に形成され、該透明電極または前記有機層上に前記絶縁層が積層形成された請求項１記載の有機エレクトロルミネッセンス素子。
【請求項３】　前記２つの電極が透明電極と金属電極からなり、前記金属電極は絶縁基板上に形成され、該金属電極または前記有機層上に前記絶縁層が積層形成された請求項１記載の有機エレクトロルミネッセンス素子。
【請求項４】　前記有機層は、１層の発光層又は発光層を含む電荷輸送層との組合わせからなる請求項１～３の何れかに記載の有機エレクトロルミネッセンス素子。
【請求項５】　前記絶縁層は、発光部を形成する前記貫通部内の前記有機層の膜厚よりも厚く形成された請求項１～４の何れかに記載の有機エレクトロルミネッセンス素子。
【請求項６】　前記絶縁層は、４００ｎｍ以上の波長をもつ光の透過率が２０％以下に形成された請求項１～５の何れかに記載の有機エレクトロルミネッセンス素子。
【請求項７】　前記絶縁層は、４００ｎｍ以上の波長をもつ光の反射率が２０％以下に形成された請求項１～５の何れかに記載の有機エレクトロルミネッセンス素子。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、陽極、有機層及び陰極の積層構造からなる固定表示セグメントを複数備えた有機エレクトロルミネッセンス素子（以下、有機ＥＬ素子と略称する）に関する。
【０００２】
【従来の技術】一般的な有機ＥＬ素子の構成を図６に示す。図６に示す有機ＥＬ素子は、硝子基板２１上にＩＴＯ（Indium Tin Oxide）からなる透明電極２２が形成され、透明電極２２上に有機蛍光体薄膜による有機層２３（正孔輸送層２３ａと発光層２３ｂの２層）が積層され、更に発光層２３ｂ上にＡｌ、Ａｇ、Ｍｇ：Ａｇ、Ａｌ：Ｌｉ等の金属電極２４が積層されており、透明電極２２と金属電極２４との間には直流電源２５が接続される。硝子基板２１の外周部分には、両電極２２，２４が外部に引き出された状態で、積層部分を覆うように背面板２６が接着剤により固着される。
【０００３】上記構成による有機ＥＬ素子では、透明電極２２を陽極として直流電源２５より電圧を印加し、透明電極２２と金属電極２４との間に電流を流す。これにより、有機層２３に対して各電極２２，２４から電子と正孔が注入される。そして、注入された電子と正孔が再結合して励起子（エキシントン）を生成し、この励起子が失活する際の光の放出（蛍光・燐光）を利用して表示を行う。このときの発光は硝子基板２１側から観測される。
【０００４】ところで、上記構成による従来の有機ＥＬ素子では、透明電極２２または金属電極２４の一方の電極をベタに形成し、他方の電極を発光パターンの形状に形成して固定パターンによる発光表示を行なっている。
【０００５】
【発明が解決しようとする課題】しかしながら、上記構成による有機ＥＬ素子において、発光パターンを透明電極２２で形成した場合、透明電極２２は一般的な金属に比べて抵抗が高いので、細い線状の発光パターンをつくると、発光部までの抵抗差により、輝度ムラを生じる。また、透明電極２２による所定の発光パターンをエッチングで得た場合、そのパターンの角部分が尖りやすい。このため、発光パターンの角部分のすぐ傍に陰極（金属電極２４）があると、その角部分に電界集中を起こし、電極間がショートして絶縁不良を起こしやすく、発光パターンが破壊されるという問題があった。
【０００６】これに対し、発光パターンを金属電極２４で形成した場合では、有機層２３が水分や有機溶剤に弱いため、湿式法を使用して発光パターンの形状を作製することが困難であった。特に、レーザで発光パターンの形状を作る場合は、生産性が悪く、加工費用も高くなるという問題があった。
【０００７】更に、発光パターンを透明電極２２、金属電極２４の何れの電極で形成した場合でも、透明電極２２と金属電極２４相互の位置合わせ精度が悪いと、発光パターン以外（例えば発光パターンに接続している配線部分）が発光したり、発光させたい部分の電極が対抗電極と対抗しないために発光パターンの一部が発光しないという字欠け現象を招くことになる。
【０００８】また、図６に示す構成の有機ＥＬ素子では、硝子基板２１に対する背面板２６の接着に使用される接着剤が粘性を有しているので、背面板２６を硝子基板２１に突き合わせて接着する際に、接着剤が発光層２３ｂに流れ込んで侵入し、発光層２３ｂを汚染するおそれがあった。
【０００９】そこで、本発明は、上記問題点に鑑みてなされたものであり、従来のように電極を精度良く発光パターンの形状に形成する必要がなく、輝度ムラの極めて少ない表示が行える有機ＥＬ素子を提供することを目的としている。
【００１０】
【課題を解決するための手段】上記目的を達成するため、請求項１の発明は、少なくとも一方の電極が透光性

部材からなる２つの電極間に有機層が積層形成され、一方の電極を陽極として電圧を印加し、前記２つの電極間に電流を流して所定のパターン表示を行う有機エレクトロルミネッセンス素子において、発光パターンの形状にくり抜かれた貫通部を有する絶縁層が前記２つの電極間に設けられたことを特徴としている。

【００１１】請求項２の発明は、請求項１の有機ＥＬ素子において、前記２つの電極が透明電極と金属電極からなり、前記透明電極は硝子基板上に形成され、該透明電極または前記有機層上に前記絶縁層が積層形成されたことを特徴としている。

【００１２】請求項３の発明は、請求項１の有機ＥＬ素子において、前記２つの電極が透明電極と金属電極からなり、前記金属電極は絶縁基板上に形成され、該金属電極または前記有機層上に前記絶縁層が積層形成されたことを特徴としている。

【００１３】請求項４の発明は、請求項１～３の何れかの有機ＥＬ素子において、前記有機層は、１層の発光層又は発光層を含む電荷輸送層との組合わせからなることを特徴としている。

【００１４】請求項５の発明は、請求項１～４の何れかの有機ＥＬ素子において、前記絶縁層は、発光部を形成する前記貫通部内の前記有機層の膜厚よりも厚く形成されたことを特徴としている。

【００１５】請求項６の発明は、請求項１～５の何れかの有機ＥＬ素子において、前記絶縁層は、４００ｎｍ以上の波長をもつ光の透過率が２０％以下に形成されたことを特徴としている。

【００１６】請求項７の発明は、請求項１～５の何れかの有機ＥＬ素子において、前記絶縁層は、４００ｎｍ以上の波長をもつ光の反射率が２０％以下に形成されたことを特徴としている。

【００１７】

【発明の実施の形態】図１は本発明による有機ＥＬ素子の第１実施の形態を示す平面図、図２は図１の部分拡大側断面図である。

【００１８】第１実施の形態による有機ＥＬ素子は、方形状に形成された絶縁性部材からなる透光性を有した硝子基板１を基部としている。

【００１９】硝子基板１の表面には、ＩＴＯ等からなる透明電極２がエッチング法、マスク蒸着法等により略均一な厚さで方形状に形成されている。この透明電極２は、１つの発光パターン３（図１のＥ，Ｌのパターン）と同等か、１つの発光パターン３より大きい面積で発光パターン３の１単位毎に形成される。

【００２０】図１、図２に示すように、透明電極２上には、例えばエポキシ樹脂、フリットガラスや有機シリカ化合物の焼成等からなる高抵抗の絶縁層４が方形状に積層形成されている。絶縁層４は、発光パターン３の形状にくり抜かれた貫通部４ａを有してパターン化されており、透明電極２の一端部（図１の例では、下端部）を残し、その他の部分を覆うように積層形成される。

【００２１】絶縁層４は、印刷法、マスク蒸着法、エッチング法等により略均一な厚さで形成される。具体的には、ＳｉＮやSiO_2をエッチング法により所望のパターン形状に抜く他、フリットガラスや有機シリカ化合物を所望のパターン形状に印刷して焼成したり、耐熱性感光樹脂をフォトリソグラフィの手法により所定のパターン形状にパターニングすることで絶縁層４を形成できる。

【００２２】図１、図２に示すように、絶縁層４上の発光パターン３を含む領域には、有機層５が積層形成されている。この有機層５は、貫通部４ａに入り込むようにして発光パターン３の１単位毎に略均一な厚さで方形状に積層形成される。本実施の形態において、有機層５は、例えばＤｉａｍｉｎｅ等の有機化合物からなる正孔輸送層５ａと、有機化合物からなる発光層５ｂとの２層で構成され、正孔輸送層５ａ、発光層５ｂの順に積層される。

【００２３】絶縁層４の貫通部４ａに入り込んだ有機層５の部分は発光部６を形成している。そして、この発光部６が発光することにより、硝子基板１側から発光パターン３の形状による表示を観測することができる。

【００２４】なお、発光層５ｂの発光材料としては、発光層５ｂそのものを発光させる場合には、例えばアルミキノリン（Ａｌｑ）やジスチルアリーレン系化合物等が使用される。また、発光層５ｂに別の発光材料（ドーパント）を微量ドーピングすることでドーパントを発光させる場合には、ドーパントとしてキナクリドン（Ｑｄ）やレーザ用の色素等が使用される。

【００２５】図１、図２に示すように、有機層５を構成する発光層５ｂ上には、２つの発光パターン３を覆うようにして金属電極７が積層形成されている。金属電極７は、Ａｌ、Ａｇ、Ｍｇ：Ａｇ、Ａｌ：Ｌｉ等からなり、エッチング法、マスク蒸着法等により略均一な厚さで方形状に形成される。この金属電極７と透明電極２との間には、透明電極２が陽極、金属電極７が陰極となるように電源（直流電源）９が接続される。

【００２６】上記構成による有機ＥＬ素子では、透明電極２を陽極として、透明電極２と金属電極７との間に電圧を印加して電流を流すと、発光パターン３の発光部６が発光する。このときの発光部６による発光パターン３の発光は、硝子基板１側から観測される。また、上記構成において、透明電極２をパルス駆動し、一方の透明電極２と金属電極７の選択により、何れかの発光パターン３（図１の例では、ＥまたはＬ）の発光部６を発光させることができる。また、複数の発光パターンを時分割で発光させ、目の残像特性を利用して複数の発光パターンを組み合わせて文字や図形を表示することができる。

【００２７】次に、図３は本発明による有機ＥＬ素子の

第２実施の形態を示す平面図、図４は図３の部分拡大側断面図である。

【００２８】第２実施の形態による有機ＥＬ素子は、方形状に形成された絶縁基板８を基部としている。この絶縁基板８は、第１実施の形態のように、必ずしも透光性を有する必要はない。なお、第１実施の形態と同一の構成要素には同一番号を付して説明する。また、各電極および各層の形成方法については、第１実施の形態と同様に行われる。

【００２９】図３、図４に示すように、絶縁基板８の表面には金属電極７が形成されている。この金属電極７は、１つの発光パターン３（図３のＥ，Ｌのパターン）と同等か、１つの発光パターン３より大きい面積で発光パターン３の１単位毎に略均一な厚さで方形状に形成される。

【００３０】金属電極７上には、高抵抗の絶縁層４が方形状に積層形成されている。絶縁層４は、第１実施の形態と同様に、発光パターン３の形状にくり抜かれた貫通部４ａを有しており、金属電極７の一端部（図３の例では、下端部）を残し、その他の部分を覆うように略均一な厚さで方形状に積層形成される。

【００３１】図３、図４に示すように、絶縁層４上の発光パターン３を含む領域には、有機層５が積層形成されている。この有機層５は、貫通部４ａに入り込むようにして発光パターン３の１単位毎に略均一な厚さで積層形成される。本実施の形態において、有機層５は、例えばＤｉａｍｉｎｅ等の有機化合物からなる正孔輸送層５ａと、有機化合物からなる発光層５ｂとの２層で構成され、発光層５ｂ、正孔輸送層５ａの順に積層される。

【００３２】絶縁層４の貫通部４ａに入り込んだ有機層５の部分は発光部６を形成している。そして、この発光部６が発光することにより、透明電極２側から発光パターン３の形状による表示を観測することができる。

【００３３】図３、図４に示すように、有機層５を構成する正孔輸送層５ａ上には、ＩＴＯ等からなる透明電極２が略均一な厚さで積層形成されている。この透明電極２と金属電極７との間には、透明電極２が陽極、金属電極７が陰極となるように電源（直流電源）９が接続される。

【００３４】上記構成による有機ＥＬ素子では、透明電極２を陽極として、透明電極２と金属電極７との間に電圧を印加して電流を流すと、発光パターン３の発光部６が発光する。このときの発光部６による発光パターン３の発光は、透明電極２側から観測される。また、上記構成において、金属電極７をパルス駆動し、一方の金属電極７と透明電極２と一方の金属電極７の選択により、何れかの発光パターン３（図３の例では、ＥまたはＬ）の発光部６を発光させることができる。

【００３５】なお、特に図示はしないが、第１実施の形態の硝子基板１の外周部分、第２実施の形態の絶縁基板８の外周部分には、水を極力取り除いた不活性ガス（例えばドライ窒素）やドライエアによる雰囲気において、封着部材としての基板が接着剤により固着される。これにより、高精細な固定パタン表示有機ＥＬデバイスを製造することができる。

【００３６】従って、上述した実施の形態によれば、以下に示す効果を奏する。

（１）透明電極２または金属電極７を発光パターン３の形状に合わせて精度良く形成する必要がない。

【００３７】（２）線状の発光パターンを形成する場合でも電極の配線幅が十分にとれるので、抵抗の高い透明電極２を線状に形成する必要が無くなり、配線抵抗の差による輝度ムラが発生しなくなる。

【００３８】（３）電極２，７の端部を発光パターンとして使用しないため、従来に比べて絶縁破壊を起こす可能性が低い。

【００３９】（４）透明電極２と金属電極７との位置合わせ精度をゆるくしてもよいので、製造に要する費用を低減できる。

【００４０】（５）絶縁層４の膜厚を有機層５より厚くすることにより、絶縁層４の製膜を容易に行うことができる。そして、発光部６が絶縁層４の表面よりも低い位置で貫通部４ａ内に形成されるので、素子の耐久性の向上を図るため、封着部材としての基板を封着した場合でも、接着剤が絶縁層４で塞き止められ、発光層５ｂへの接着剤の侵入を阻止できる。しかも、封着部材としての基板が発光部６に直接接触することがなく、振動により基板が発光部６に損傷を与えることがない。

【００４１】（６）例えば４００ｎｍ以上の波長をもつ光の透過率が２０％以下になるように、絶縁層４を暗色（例えば茶色や黒色等）物質で構成して透光性を低下させることにより、絶縁層４を通して金属電極７の反射がなくなり、明るい場所でのコントラストが向上する。

【００４２】（７）例えば４００ｎｍ以上の波長をもつ光の反射率が２０％以下になるように、絶縁層４を形成して反射率を低くすることにより、絶縁層４からの反射が少なくなり、明るい場所でのコントラストが向上する。

【００４３】ところで、上述した各実施の形態では、有機層５が正孔輸送層５ａと発光層５ｂの２層構造からなるものとして説明したが、この有機層５は、発光層と電荷輸送層（正孔輸送層、正孔注入・輸送層、電子注入層、電子注入・輸送層等）との組合わせで構成してもよい。具体的には、発光層１層のみ、発光層と正孔輸送層の２層、発光層と電子注入層の２層、正孔輸送層と発光層と電子注入層の３層等で構成される。なお、電子注入層としては、電子の注入をし易くするため、例えばＬｉ，Ｎａ，Ｍｇ，Ｃａ等の仕事関数の小さい金属材料単体、或いは例えばＡｌ：Ｌｉ，Ｍｇ：Ｉｎ，Ｍｇ：Ａｇ等の仕事関数の小さい合金が使用される。

BEST AVAILABLE COPY

【００４４】また、第１実施の形態では、発光パターン３の形状に合った貫通部４ａを有する絶縁層４を透明電極２上に積層形成する構成とし、また、第２実施の形態では、同絶縁層４を金属電極２上に積層形成する構成としたが、有機層を構成する何れかの層（例えば正孔輸送層、発光層、電子注入層の何れか）上に絶縁層４を積層形成する構成としてもよい。

【００４５】更に、各実施の形態における絶縁層４は、透明電極２と金属電極７との間の絶縁が得られ、発光パターン３以外の部分が発光しない程度の厚さで形成すればよい。また、絶縁層４をある程度厚くすれば、電極（第１実施の形態の金属電極７、または第２実施の形態の透明電極２）を外部に引き出した状態で、絶縁層４と同一外形の基板を絶縁層４の外周部分に固着して外囲器を構成し、大型の素子を作製したときの補強材（支柱）として作用することができる。

【００４６】ところで、図５に示すように、所望色のフィルタ１１が固着された透光性を有する封着部材としての基板（例えば硝子基板）１２を、透明電極２表面の凹部１０にフィルタ１１が位置するように透明電極２上に固着する構成としてもよい。この構成によれば、凹凸の出来やすいフィルタを電極上に配設する構成とは違って、電極２，７や絶縁基板８の厚さに関係なくフィルタ１１を配設することができる。なお、図５は、第２実施の形態の変形例であり、第２実施の形態と同一の構成要素には同一番号を付し、その説明を省略する。

【００４７】また、各実施の形態において、透明電極２と金属電極７によりＸＹマトリックスを構成し、両電極２，７の交点を時分割して発光させれば、ドットの集合で画像の表示を行う有機ＥＬ素子を構成することができる。

【００４８】

【発明の効果】以上の説明で明らかなように、本発明によれば、輝度ムラの極めて少ない素子を作製でき、下記に示すような効果を奏する。

（１）電極を発光パターンの形状に合わせて精度良く形成する必要がなく、ラフに形成することができる。

（２）線状の発光パターンを形成する場合でも電極の配線幅が十分にとれるので、抵抗の高い透明電極を線状に形成する必要が無く、配線抵抗の差による輝度ムラが発生しない。

（３）電極の端部を発光パターンとして使用しないため、絶縁破壊を起こすことが少ない。

（４）電極同士の位置合わせ精度をゆるくでき、製造費用を低減できる。

（５）絶縁層の膜厚を有機層より厚くすることにより、絶縁層の製膜が容易に行える。そして、発光部が絶縁層の表面よりも低い位置に形成されるので、耐久性の向上を図るため、封着部材としての基板を封着した場合でも、接着剤を絶縁層で塞き止めて発光層への侵入を阻止できる。しかも、封着部材としての基板が発光部に直接接触することがなく、振動による発光部の損傷を防止できる。

（６）４００ｎｍ以上の波長をもつ光の透過率が２０％以下になるように絶縁層を形成することにより、絶縁層を通して金属電極の反射がなくなり、明るい場所でのコントラストが向上する。

（７）４００ｎｍ以上の波長をもつ光の反射率が２０％以下になるように絶縁層を形成することにより、絶縁層からの反射が少なくなり、明るい場所でのコントラストが向上する。

【図面の簡単な説明】

【図１】本発明による有機ＥＬ素子の第１実施の形態を示す平面図

【図２】図１の部分拡大側断面図

【図３】本発明による有機ＥＬ素子の第２実施の形態を示す平面図

【図４】図３の部分拡大側断面図

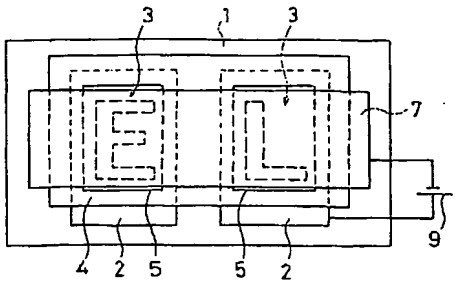
【図５】本発明による有機ＥＬ素子の他の実施の形態を示す側断面図

【図６】従来の有機ＥＬ素子の一例を示す側断面図

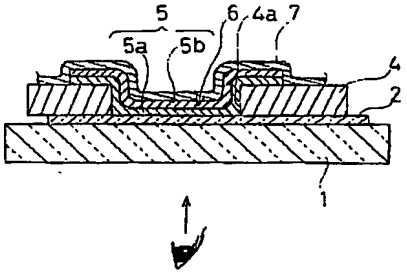
【符号の説明】

１…硝子基板、２…透明電極、３…発光パターン、４…絶縁層、４ａ…貫通部、５…有機層、５ａ…正孔輸送層、５ｂ…発光層、６…発光部、７…金属電極、８…絶縁基板。

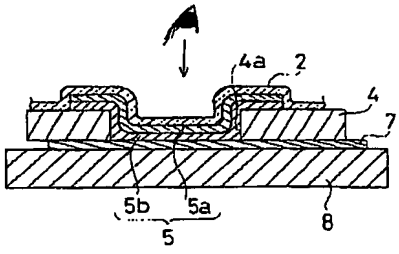
【図１】



【図２】

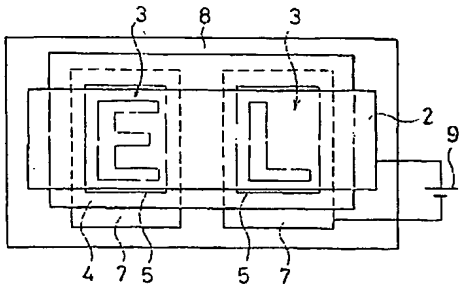


【図４】

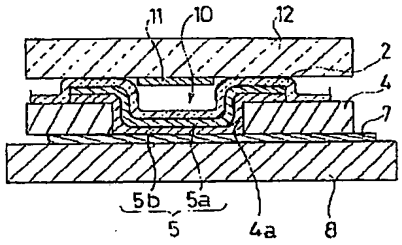


BEST AVAILABLE COPY

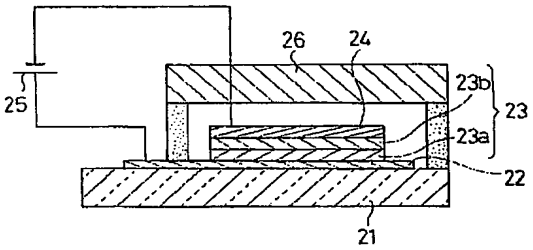
【図3】



【図5】



【図6】



フロントページの続き

(72)発明者　宮内　寿男
千葉県茂原市大芝629　双葉電子工業株式
会社内